67

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/543,480	04/06/2000	Venugopal Srinivasan	28049/36241	7414

34431 7590 10/06/2004

GROSSMAN & FLIGHT, LLC
20 N. WACKER DRIVE
SUITE 4220
CHICAGO, IL 60606

EXAMINER	
SHELEHEDA, JAMES R	

ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 10/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 09/543,480	**Applicant(s)** SRINIVASAN, VENUGOPAL	
	Examiner James Sheleheda	**Art Unit** 2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *40-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *42-55* is/are allowed.

6)☒ Claim(s) *40,41 and 55-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *09/01/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 41 and 49 are objected to because of the following informalities:

In claim 41, line 3, "a sampler configured to an audio signal" should be changed to --a sampler configured to sample an audio signal--.

In claim 41, line 6, "a combiner configured to the sub blocks" should be changed to --a combiner configured to combine the sub blocks --.

In claim 48, line 3, "a sampler configured to the audio signal" should be changed to --a sampler configured to sample the audio signal--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 40, 41 and 58-63 are rejected under 35 U.S.C. 102(b) as being anticipated by Jensen et al. (Jensen) (5,764,763).

As to claim 40, Jensen discloses a method of creating an encoded time domain audio signal (column 7, lines 6-18) comprising:

sampling an audio signal (column 18, lines 30-47) to generate a plurality of sub blocks (individual signal samples) of sampled audio (column 18, lines 30-47), each of the sub blocks having a duration less than a minimum audibly perceivable signal delay (wherein a single signal sample is inherently unperceivable audibly; column 18, lines 30-47);

combining the sub blocks into a plurality of windowed overlapping short blocks (wherein the samples are arranged into temporally overlapping windows for an FFT; column 18, lines 35-40 and 48-52 and column 14, lines 41-45);

sequentially transforming (through an FFT) each of the windowed overlapping short blocks into a frequency domain (wherein the FFT creates a plurality of frequency bins out of the windowed samples; column 14, lines 38-45 and column 18, lines 30-40);

encoding (Fig. 1; column 6, lines 19-20) each transformed short block in the frequency domain by:

selecting a code signal frequency to encode to the transformed short block (determining which code frequencies to include in the audio signal; column 14, lines 51-56) based on data to be embedded (based upon which codes in memory to be inserted; column 14, lines 51-56 and column 13, lines 39-46);

determining a masking energy associated with the code signal frequency to be encoded in the transformed short block (masking ability energy levels of the frequency bin the code belongs with; masking column 15, lines 1-7);

selecting an amplitude for the code signal frequency (adjusting the code amplitude to be masked by the audio segment; column 15, lines 7-12 and column

16, lines 3-11) for the transformed short block (for the selected frequency bin; column 15, lines 1-12) based on the masking energy (column 15, line 1-11 and column 16, lines 3-11);

synthesizing a code signal (outputting the code signal at the appropriate amplitude; column 17, lines 11-18);

adding the synthesized code signal to the transformed short block to form an encoded short block (wherein the code is combined with the audio signal; Fig. 7D, step 716; column 19, lines 51-53 and column 9, lines 16-20); and

transforming the encoded short block into a time domain to form an encoded time domain short block (outputting the encoded signal to DAC, 140 for transmission; Fig. 7D, step 718; column 19, lines 51-53 and column 9, lines 16-20); and

constructing an encoded time domain signal (audio signal output over the air; column 17, lines 29-47) from at least two sequential ones of the encoded time domain short blocks (wherein the encoding process in repeated for subsequent received samples; column 18, lines 36-41), wherein the encoded time domain signal is generated without buffering an entire long block of audio samples (wherein the process begins as soon as enough samples for the first FFT have been stored; column 18, lines 36-41) and without transforming the entire long block of audio samples into the frequency domain (wherein the transformation is performed for each small window of samples; column 18, lines 36-41).

As to claim 41, Jensen discloses an apparatus for creating an encoded time domain audio signal (Fig. 1) comprising:

a sampler (DSP, 104) configured to sample an audio signal (column 18, lines 30-47) to generate a plurality of sub blocks (individual signal samples) of sampled audio (column 18, lines 30-47), each of the sub blocks having a duration less than a minimum audibly perceivable signal delay (wherein a single signal sample is inherently unperceivable audibly; column 18, lines 30-47);

a combiner (DSP, 104) configured to combine the sub blocks into a plurality of windowed overlapping short blocks (wherein the samples are arranged into temporally overlapping windows for an FFT; column 18, lines 35-40 and 48-52 and column 14, lines 41-45);

a transformer (DSP, 104 performing FFT) configured to sequentially transform (through an FFT) each of the windowed overlapping short blocks into a frequency domain (wherein the FFT creates a plurality of frequency bins out of the windowed samples; column 14, lines 38-45 and column 18, lines 30-40);

an encoder (Fig. 1; column 6, lines 19-20) configured to encode each transformed short block in the frequency domain by:

selecting a code signal frequency to encode to the transformed short block (determining which code frequencies to include in the audio signal; column 14, lines 51-56) based on data to be embedded (based upon which codes in memory to be inserted; column 14, lines 51-56 and column 13, lines 39-46);

determining a masking energy associated with the code signal frequency to be encoded in the transformed short block (masking ability energy levels of the frequency bin the code belongs with; masking column 15, lines 1-7);

selecting an amplitude for the code signal frequency (adjusting the code amplitude to be masked by the audio segment; column 15, lines 7-12 and column 16, lines 3-11) for the transformed short block (for the selected frequency bin; column 15, lines 1-12) based on the masking energy (column 15, line 1-11 and column 16, lines 3-11);

synthesizing a code signal (outputting the code signal at the appropriate amplitude; column 17, lines 11-18);

adding the synthesized code signal to the transformed short block to form an encoded short block (wherein the code is combined with the audio signal; Fig. 7D, step 716; column 19, lines 51-53 and column 9, lines 16-20); and

transforming the encoded short block into a time domain to form an encoded time domain short block (outputting the encoded signal to DAC, 140 for transmission; Fig. 7D, step 718; column 19, lines 51-53 and column 9, lines 16-20),

wherein the encoder is configured to construct an encoded time domain signal (audio signal output over the air; column 17, lines 29-47) from at least two sequential ones of the encoded time domain short blocks (wherein the encoding process in repeated for subsequent received samples; column 18, lines 36-41), wherein the encoded time domain signal is generated without buffering an entire

long block of audio samples (wherein the process begins as soon as enough samples for the first FFT have been stored; column 18, lines 36-41) and without transforming the entire long block of audio samples into the frequency domain (wherein the transformation is performed for each small window of samples; column 18, lines 36-41).

As to claim 58, Jensen discloses a method of communicating an audio signal (column 7, lines 6-18) comprising:

encoding the audio signal by sequentially performing a low resolution frequency transformation (small FFT; column 19, lines 46-48 and 30-36) on a sequence of overlapping short blocks (column 19, lines 46-48 and column 18, lines 36-40 and lines 48-52) to estimate a masking energy at a frequency to be encoded (permissible energy levels at each signal frequency; column 19, lines 38-51), the low resolution frequency transformation being the only transformation from a time domain to a frequency domain used to encode the audio signal to form an encoded audio signal (wherein the high frequency transformation can be replaced with digital filter; Fig. 7D, column 19, lines 38-41 and column 14, lines 38-50); and

extracting a code from the audio signal (column 26, lines 53-62) by performing a high resolution frequency transformation (a high resolution overlapping FFT is performed on received audio signals; column 25, lines 18-29 and column 18, lines 30-40).

As to claim 59, Jensen discloses wherein extracting the code from the encoded audio signal comprises extracting the code from the encoded audio signal without employing a result of a low resolution frequency transformation (wherein only the high resolution overlapping FFT is performed in the decoding step; see Fig. 12B and column 26, lines 41-52).

As to claim 60, Jensen discloses wherein at least one of the low resolution frequency transformation (at the encoder) and the high resolution frequency transformation (at the decoder) comprises a Fourier frequency transformation (at the encoder; column 19, lines 46-48 and 30-36; at the decoder; column 25, lines 18-29 and column 18, lines 30-40).

As to claim 61, Jensen discloses a method of communicating an audio signal (column 7, lines 6-18) comprising:

encoding the audio signal by sequentially performing a low resolution frequency transformation (small FFT; column 19, lines 46-48 and 30-36) on a sequence of overlapping short blocks (column 19, lines 46-48 and column 18, lines 36-40 and lines 48-52) to estimate a masking energy at a frequency to be encoded (permissible energy levels at each signal frequency; column 19, lines 38-51), wherein the audio signal is encoded without employing a result of a high resolution frequency transformation (wherein the high frequency transformation can be replaced with digital filter; Fig. 7D, column 19, lines 38-41 and column 14, lines 38-50); and

extracting a code from the audio signal (column 26, lines 53-62) by performing a high resolution frequency transformation (a high resolution overlapping FFT is performed on received audio signals; column 25, lines 18-29 and column 18, lines 30-40).

As to claim 62, Jensen discloses wherein extracting the code from the encoded audio signal comprises extracting the code from the encoded audio signal without employing a result of a low resolution frequency transformation (wherein only the high resolution overlapping FFT is performed in the decoding step; see Fig. 12B and column 26, lines 41-52).

As to claim 63, Jensen discloses wherein at least one of the low resolution frequency transformation (at the encoder) and the high resolution frequency transformation (at the decoder) comprises a Fourier frequency transformation (at the encoder; column 19, lines 46-48 and 30-36; at the decoder; column 25, lines 18-29 and column 18, lines 30-40).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jensen in view of Davis et al. (Davis) (5,583,962).

As to claim 56, Jensen discloses a method of inserting an inaudible code into an audio signal (column 7, lines 6-18) comprising:

sampling the audio signal (column 18, lines 30-47) to generate a plurality of partially overlapping short blocks (wherein the samples are arranged into temporally overlapping windows for an FFT; column 18, lines 35-40 and 48-52 and column 14, lines 41-45) which together comprise a long block (wherein the short blocks together form a single audio broadcast; column 7, lines 6-18);

generating an encoded long block (the output program audio signal; column 7, lines 6-18) by individually encoding each of the short blocks (wherein the short blocks individually have codes inserted; column 14, lines 51-61) at a plurality of frequency bands (wherein the blocks are part of different frequency bins; column 14, lines 51-61) by sequentially transforming (through an FFT) each of the short blocks into a frequency domain (wherein the FFT creates a plurality of frequency bins out of the windowed samples; column 14, lines 38-45 and column 18, lines 30-40) and adjusting an amplitude (adjusting the code amplitude to be masked by the audio segment; column 15, lines 7-12 and column 16, lines 3-11) of a frequency (the frequency of the code signal to be inserted; column 14, lines 51-56 and column 15, lines 7-12) in each of the plurality of frequency bands in each of the short blocks (wherein the procedure is performed for every frequency bin component; column 14, lines 51-61);

transforming the encoded short blocks into the time domain to form an encoded time domain signal (outputting the encoded signal to DAC, 140 for transmission; Fig. 7D, step 718; column 19, lines 51-53 and column 9, lines 16-20);

transmitting the encoded time domain signal (column 17, lines 34-47);

receiving the encoded time domain signal (column 24, lines 47-56);

identifying an encoded long block in the received time domain signal (wherein the receiver finds and removes the audio signal from the received radio signal; column 17, lines 34-47 and column 24, lines 50-54 and 59-67); and

decoding the encoded long block (column 25, lines 12-14) by transforming the entire encoded long block (wherein the process is performed for the entire signal whenever enough samples are present; column 25, lines 14-24) into the frequency domain (through a overlapping FFT; column 25, lines 18-24) and determining if a same code is identified by a majority (wherein the code is identified as the code with greatest number of received components; column 30, lines 55-62) of the plurality of frequency bands (the plurality of different possible frequency bins used to hide code components; column 25, lines 31-34 and column 26, lines 7-19).

While Jensen discloses adjusting an amplitude of a frequency, he fails to specifically disclose adjusting a phase angle.

In an analogous art, Davis discloses an audio encoding and transmission system (column 6, lines 14-33) wherein the phase of signal components to be combined will be inverted (or adjusted; column 21, lines 16-23) to reduce signal noise due to phase cancellation (column 21, lines 16-23).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to modify Jensen's system to include adjusting a phase angle, as taught by Davis, for the typical benefit of reducing phase cancellation when combining signal components.

As to claim 57, Jensen discloses an apparatus for inserting an inaudible code into an audio signal (Fig. 1; column 7, lines 6-18) comprising:

a sampler (DSP, 104) configured to sample the audio signal (column 18, lines 30-47) to generate a plurality of partially overlapping short blocks (wherein the samples are arranged into temporally overlapping windows for an FFT; column 18, lines 35-40 and 48-52 and column 14, lines 41-45) which together comprise a long block (wherein the short blocks together form a single audio broadcast; column 7, lines 6-18);

a generator (DSP, 104) configured to generate an encoded long block (the output program audio signal; column 7, lines 6-18) by individually encoding each of the short blocks (wherein the short blocks individually have codes inserted; column 14, lines 51-61) at a plurality of frequency bands (wherein the blocks are part of different frequency bins; column 14, lines 51-61) by sequentially transforming (through an FFT) each of the short blocks into a frequency domain (wherein the FFT creates a plurality of frequency bins out of the windowed samples; column 14, lines 38-45 and column 18, lines 30-40) and adjusting an amplitude (adjusting the code amplitude to be masked by the audio segment; column 15, lines 7-12 and column 16, lines 3-11) of a frequency (the frequency of the code signal to be inserted; column 14, lines 51-56 and column 15, lines

7-12) in each of the plurality of frequency bands in each of the short blocks (wherein the procedure is performed for every frequency bin component; column 14, lines 51-61);

a transformer (DSP, 104 through an FFT) configured to transform the encoded short blocks into the time domain to form an encoded time domain signal (outputting the encoded signal to DAC, 140 for transmission; Fig. 7D, step 718; column 19, lines 51-53 and column 9, lines 16-20);

a transmitter (inherent to enable radio broadcast of the signal) configured to transmit the encoded time domain signal (column 17, lines 34-47);

a receiver (Fig. 11; input terminal, 260) configured to receive the encoded time domain signal (column 24, lines 47-56);

an identifier (Fig. 11; analog conditioning circuits, 262) configured to identify an encoded long block in the received time domain signal (wherein the receiver finds and removes the audio signal from the received radio signal; column 17, lines 34-47 and column 24, lines 50-54 and 59-67); and

a decoder (Fig. 11; DSP, 266) configured to decode the encoded long block (column 25, lines 12-14) by transforming the entire encoded long block (wherein the process is performed for the entire signal whenever enough samples are present; column 25, lines 14-24) into the frequency domain (through a overlapping FFT; column 25, lines 18-24) and determining if a same code is identified by a majority (wherein the code is identified as the code with greatest number of received components; column 30, lines 55-62) of the plurality of frequency bands (the plurality of different possible

frequency bins used to hide code components; column 25, lines 31-34 and column 26, lines 7-19).

While Jensen discloses adjusting an amplitude of a frequency, he fails to specifically disclose adjusting a phase angle.

In an analogous art, Davis discloses an audio encoding and transmission system (column 6, lines 14-33) wherein the phase of signal components to be combined will be inverted (or adjusted; column 21, lines 16-23) to reduce signal noise due to phase cancellation (column 21, lines 16-23).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to modify Jensen's system to include adjusting a phase angle, as taught by Davis, for the typical benefit of reducing phase cancellation when combining signal components.

Allowable Subject Matter

6. The following is a statement of reasons for the indication of allowable subject matter:

Claims 42-48 are allowable because the prior art fails to teach or disclose a method of inserting an inaudible code into an audio signal, comprising: sampling the audio signal to generate sub blocks, combining the sub blocks into short blocks, transforming each of the short blocks into the frequency domain, encoding each transformed block, selecting a frequency to encode, setting an amplitude of the at least one frequency, setting a phase angle of the at least one frequency, transforming the

encoded short block into the time domain, constructing an encoded time domain signal from at least two sequential ones of the encoded time domain short blocks, wherein **the phase angles of the encoded short blocks are set by setting the phase angle of the at least one frequency of a first short block to a first predetermined value, and incrementing the phase angle of each subsequent short block by a predetermined amount,** as recited in the claims.

Claims 49-55 are allowable because the prior art fails to teach or disclose a apparatus for inserting an inaudible code into an audio signal, comprising: a sampler which samples the audio signal to generate sub blocks, a combiner which combines the sub blocks into short blocks, a transformer which transforms each of the short blocks into the frequency domain, an encoder which encodes each transformed block, selecting a frequency to encode, setting an amplitude of the at least one frequency, setting a phase angle of the at least one frequency, transforming the encoded short block into the time domain, constructing an encoded time domain signal from at least two sequential ones of the encoded time domain short blocks, wherein **the phase angles of the encoded short blocks are set by setting the phase angle of the at least one frequency of a first short block to a first predetermined value, and incrementing the phase angle of each subsequent short block by a predetermined amount,** as recited in the claims.

A background search found similar prior art, however, not completely as claimed.

For example, Davis et al. (5,583,962) discloses a method adjust the phase angle of combined singles to reduce phase cancellation. Davis et al. fails, however, to specifically disclose wherein the phase angles are set by setting the phase angle of the at least one frequency to a first predetermined value, and incrementing the phase angle by a predetermined amount.

Yasunaga et al. (6,453,288) discloses a transmission system wherein transmitted frames of data will have theirs phase angles randomly set based upon values stored in a table. Yasanuga fails, however, to disclose incrementing the phase angle by a predetermined amount.

Conclusion

7. The following are suggested formats for either a Certificate of Mailing or Certificate of Transmission under 37 CFR 1.8(a). The certification may be included with all correspondence concerning this application or proceeding to establish a date of mailing or transmission under 37 CFR 1.8(a). Proper use of this procedure will result in such communication being considered as timely if the established date is within the required period for reply. The Certificate should be signed by the individual actually depositing or transmitting the correspondence or by an individual who, upon information and belief, expects the correspondence to be mailed or transmitted in the normal course of business by another no later than the date indicated.

Certificate of Mailing

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

on __________.
(Date)

Typed or printed name of person signing this certificate:

____

Signature: ____________________________________

Certificate of Transmission

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office, Fax No. (703)_____ - ________ on _____________.
(Date)

Typed or printed name of person signing this certificate:

____

Signature: ____________________________________

Please refer to 37 CFR 1.6(d) and 1.8(a)(2) for filing limitations concerning facsimile transmissions and mailing, respectively.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Sheleheda whose telephone number is (703) 305-8722. The examiner can normally be reached on 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Miller can be reached on (703) 305-4795. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James Sheleheda
Patent Examiner
Art Unit 2614

JS

JOHN MILLER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600